Study of Reproduction Processes and Ex-situ Conservation of the Tertiary Relict Species Parrotia persica C. A. Mey. in conditions of Tbilisi

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Abstract:

The present work was aimed at studying the relict species of the Tertiary period, representative of Hyrcanian forest - Parrotia persica included in Red List of Caucasus (2009). Successive phases of reproduction processes, issues of propagation have been investigated. The following regularities were revealed in the process of investigation: fluctuation in number of bracts, flowers and stamens, presence of a great number of stamens, thick bracts and dense pubescence of inflorescences and flowers, formation of the thick three layered cover of ovary after fertilization, absence of petals and stigma, non-regular regime of fruiting. In conditions of the NBGGG plants produce few (maximum 20) seedlings developed from seeds as a result of self seeding and small number of sprouts around the tree. Plants obtained from sprouts transplanted by us, are grown as living collections at the Department of Plant Conservation. Vegetative propagation together with sexual propagation allows obtaining of established seedlings in a comparatively short time. Living collections were created for establishing in the culture of this economically valuable, highly ornamental plant. Ex-situ conservation work has been carried out – more than 1000 seeds are deposited for long-term storage at the Caucasus Regional Seed Bank.

Key words: reproduction biology, flower structure, propagation, conservation, living collection.

Introduction:

Aim of the present work was to study development of male and female reproductive spheres of relict tree of the Tertiary period, representative of Hyrcanian forest Parrotia persica included in Red List of Caucasus (2009) in conditions of National Botanical Garden of Georgia in order to establish seed forming capacity of the species. The species is poorly studied from this viewpoint. Results of research will contribute to establishing in the culture of this highly ornamental element of the landscape and economically important source of valuable wood material.

Materials and methods:

In investigations we have used plant material obtained from trees of Parrotia persica growing at the collection plot of the Department of Plant Conservation, National Botanical Garden of Georgia (NBGG) (N 41°41.122’ E0 44°48.114’ 518 m a.s.l.; mean annual temperature 12.6°C, minimum January temperature -0.5°C, absolute minimum -18°C, mean annual precipitation 518 mm, summer and winter moderately dry). Female and male generative structures were studied at different developmental stages using light microscope (Carl Zeiss, Germany).

Results and discussion:

Generative processes start in winter. In January inflorescences – capituli, wrapped into thick, fleshy, brown, villous leaf-like bracts are produced on bare twigs. Each flower in the inflorescence has its own covering sepal, stamen, twin pistil, consisting of two styles accreted in the lower part. Stigma and petals are not defined. Flowering starts from the second half of March (Fig. 1). Open inflorescences contain numerous 56-78 stamens of red color. Filaments long (1 cm), comprising 2/3 of the whole length of a stamen (1.5 cm). Pollen sacs tetrathecal (Fig. 2); pollen grains numerous, mainly viable, triporous, binuclear, (Fig. 3). Numerous pollen and glossy reddish-crimson colour create impression of a spectacular blossoming (Fig. 4). Flowering is asynchronous.

Mature pollen sac dehisces from both sides, along the whole length and pollen grains
scatter on the style (Fig. 5). Open type style has a wide furrow. Epidermis inside a furrow has nutritive function and provides transition of pollen tube towards the ovary (Fig. 6). At this stage styles are lengthened, twisted, pale rose, well defined. By the end of April only single pistils become detectable. Tips of twin pistils become dried. Numerosity of stamens and correspondingly pollen grains ensure quite high percentage of pollination and fertilization.

 Mostly 2-3 flowers in inflorescence produce seeds. Sometimes embryogenesis does not come to the end and seeds remain underdeveloped. Fruit is a bilocular capsule, with two seeds; seed oval, dark brown, lustrous. Number of formed seeds differs by years. 1000 seeds are deposited for storage at the Caucasus Regional Seed Bank.

Conclusion:

In the process of investigation instability of some traits related to the reproductive sphere and other peculiarities have been revealed: fluctuation in number of bracts, flowers and stamens, presence of a great number of stamens, thick bracts and dense pubescence of inflorescences and flowers, formation of the thick three layered cover of ovary after fertilization, absence of petals and stigma, non-regular regime of fruiting, etc.

In conditions of the NBGG plants have produced few (maximum 20) seedlings developed from seeds as a result of self seeding and small number of sprouts around the tree. Plants obtained from sprouts transplanted by us, are grown as living collections at the Department of Plant Conservation. They grow taller in open humid environment than in dry conditions in neighbourhood with other plants. Vegetative propagation together with sexual propagation allows obtaining of established seedlings in a comparatively short time.
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Fig. 4. Splitted mature pollen sac of Parrotia persica

Fig. 5. Pistil of Parrotia persica

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